lus (3), Hedysarum, Lathyrus, Capnoides (2), Lepidium (3), Thelypodium (2), Pleurophragma, Sophia (2), and Arabis.—J. M. C.

Ammonifying soil nitrogen.—LIPMAN has made another valuable contribution to soil bacteriology.[20] His experiments were exceedingly well planned, were fundamental, and in most cases gave consistent results. So much detail is included in the report that a satisfactory summary of the article is impossible.

He first tested the ability of various soils to ammonify nutrient solutions of peptone, and solutions containing peptone and inorganic salts. The addition of the salts favors the growth of certain species of bacteria and also ammonification under certain conditions. These species were unequally distributed in soils. Inoculation with soil infusion was decidedly inferior to inoculation with soil itself. But soil infusions in the same sterile soil exhibit relations similar to those of the corresponding direct soil inoculations. The inoculation of sterile soils in various ways shows that in ammonification the bacteriological soil factor is much more important than the chemical one. Manured soils showed a superior ammonifying power. Peptone salt solutions which are not provided with too large a quantity of mineral are most suitable for study of the general condition of the bacterial flora of the soil. The differences in the power of ammonification exhibited by several soils seem to bear no direct relation to their mechanical composition. The amount of the sterile soil which is inoculated affects the yield of ammonia, the amount of ammonia being larger, in nearly every case, in the larger samples of soil. This may be due to increased production of ammonia by ammonification of the soil nitrogen; or, more probably, to the larger amount of other mineral substances present which may be useful to the organism; or possibly to the absorption of deleterious products by the soils. Old samples of soil kept in a laboratory for some months had decidedly lower ammonifying power than the younger samples. Original differences in the ammonifying power of the different soils, however, were not entirely obliterated, even after keeping the samples in the laboratory for several months.

Lime added to the soil often stimulated the activity of decay bacteria, the stimulus increasing with the amount of lime up to two tons per acre. The author suggests that it may be possible to develop a bacteriological method of determining the lime requirements of soils in general. More consistent results were obtained by soluble nitrogenous material, such as peptone and gelatin, than by insoluble substances, like albumen, casein, and cotton-seed meal. As a rule, ammonia is produced very rapidly; the amounts given off in three days were nearly as large as in thirty-two days, and in some cases they were larger.

Working with Azotobacter, LIPMAN found that small quantities of soil did not furnish enough mineral salts, whereas in larger quantities a normal growth was obtained. He therefore suggests that it may be possible to measure the mineral

[20] LIPMAN, G. B., Chemical and bacteriological factors in the ammonification of soil nitrogen. Report N. J. Agric. Exp. Sta. **1906**:119–187. 1907.

deficiencies of soils by determining how much soil is required to give normal Azotobacter formation.—F. L. STEVENS.

Fossil Osmundaceae.—KIDSTON and GWYNNE-VAUGHAN[21] describe the structure of two osmundaceous stems from the Jurassic of New Zealand. On account of the difficulty of distinguishing anatomically between Osmunda and Todea, they put these stems under the provisional genus *Osmundites*. One of the stems, *O. Dunlopi*, is characterized by an extremely small central cylinder, comparable with that found in the filmy Todeas of the present day. In this species the foliar gaps are much reduced and are said by the authors even to be absent sometimes. The other new species, *O. gibbiana*, has a better developed stele and its foliar gaps are very similar to those of living species of Osmunda. The authors add something to our knowledge of the *Osmundites skidegatensis* of PENHALLOW, from the Lower Cretaceous of Western Canada. In this species they describe well-developed internal phloem. The medullary tissues clearly become continuous with those of the cortex through the very broad foliar gaps. Concerning this species the authors say: "At first sight (it) appears to provide something very like the dictyostelic ancestor postulated by JEFFREY'S theory." They conclude, however, with BOODLE and the majority of other British anatomists, since there is an absence of internal phloem in the young plant of living species of Osmunda, that on the hypothesis of recapitulation internal phloem and the accompanying structures must have been absent in the ancestors of the Osmundaceae. This argument, however, is quite fallacious. It would apparently be just as reasonable to assume that the mesarch foliar and peduncular bundles of the Cycadales are not an ancestral feature, as is generally admitted, especially in Great Britain, because forsooth they have not been shown to occur in the stem of cycadean seedlings. Moreover, those who hold with GWYNNE-VAUGHAN, WORSDELL, and others, that the condition without internal phloem is ancestral in the case of the tubular central cylinder of the stem in the Filicales, find likewise no ontogenetic support whatever for their views among the very numerous ferns in which the tubular central cylinder of the adult is siphonostelic with internal phloem. Ontogeny at present throws no light whatever on the subject of the presence or absence of internal phloem in the primitive tubular central cylinder of the fern series. Argument accordingly must be based on comparative anatomy alone, and that being the case there is apparently as good reason to consider the concentric type of bundle to be ancestral for the leaf and stem of the Osmundaceae as there is to regard the mesarch xylem bundle as ancestral for leaf and shoot in the cycadean series. The authors follow SCOTT in regarding the Botryopterideae as among the most primitive ferns. They consider that their *Osmundites Dunlopi* furnishes evidence that the Osmundaceae have come from this group. There is apparently no better reason for regarding *Osmundites Dunlopi* and *O. gibbiana* as primitive Osmundaceae than the similarly austral types, Agathis and Araucaria, as primitive araucarian conifers.—E. C. JEFFREY.

[21] KIDSTON, R., and GWYNNE-VAUGHAN, D. T., On the fossil Osmundaceae. Trans. Roy. Soc. Edinburgh 45:759–780. *pls. 1–6.* 1907.